SANITARY SURVEY TOWN OF LARDER LAKE

1977

Ministry
of the
Environment
Ontario

SANITARY SURVEY

TOWN OF LARDER LAKE

PREPARED BY:

TIMMINS DISTRICT ~~STAFF~~ Office
NORTHEASTERN REGION

1977

INDEX

REPORT

Ministry of the Environment

Municipality.......... Date of Inspection June 1977

Re: Sanitary Survey - Town of Larder Lake

Field Inspection by.......... Report by..........

INTRODUCTION

Appendix 1-1 Map of Larder Lake

Larder Lake is located in the District of Timiskaming in the Townships of Hearst and McVittie.

A sanitary survey of the Town was conducted from June 8 to June 22, 1977, by four members of the Northeastern Region, Ministry of the Environment staff. The survey consisted of four parts:

a) a sanitary survey;
b) a chemical and bacteriological analysis of the Town Creek and adjoining ditches;
c) a beach bacteriological analysis;
d) and a lake survey.

GENERAL INFORMATION

The Town of Larder Lake is located 20 miles east of Kirkland Lake and 11 miles west of the Ontario/Quebec border. The community itself is located on Spoon Bay in the Northwest corner of Larder Lake.

The Municipal Directory for 1977 estimated the Town's population at approximately 1,251 people. There is no industry in Larder Lake. The community is completely residential with the population being made up of mainly retired citizens or of individuals who work in adjacent centres such as Virginiatown or Kirkland Lake.

Drainage of the townsite is divided by a rock outcrop which extends south from Highway #66 towards the lake between Godfrey and Commissioner Street. The Town area east of the outcrop drains toward the lake. The west half drains to the main creek which extends from north of Highway #66 across the townsite to the foot of Commissioner Street where it enters Spoon Bay.

A communal municipal water distribution system supplies water to the entire community. Water is obtained from a single drilled well located to the south of the community. No treatment or disinfection is provided for the water which is supplied to the consumers in its raw state.

There are two main recreational areas within the community: Government beach, on the shoreline of Spoon Bay near the foot of 7th Avenue; the other is Raven Beach located on the east side of the peninsula.

The Town of Larder Lake has approximately 75% of its dwellings serviced by sanitary sewers. The serviced population is approximately 1,000 people. These sanitary collector sewers deliver the wastes to the primary sewage treatment plant located at the corner of Ninth Avenue and Commissioner Street, adjacent to Spoon Bay.

There are no storm sewers in this community. As a result much of the storm water either drains into open ditches or into the sanitary sewers.

SEWAGE DISPOSAL PRACTICES

A) Sewered Area

Refer to Appendix I - 1 for Map

The sewered area of Larder Lake includes:

1) The area west of Ontario Street between 6th Avenue and 9th Avenue.
2) The portion of Larder Lake between Commissioner Street and Market Street from north of Highway #66 to the Lake.

The sewers themselves range in diameter from 8" to 18". There have been problems attributed to infiltration of existing sewers by rainfall. Several instances of back-ups have been noted during times of heavy rainfall. Precipitation data and sewage effluent flows for the same period were analysed to see if there is a correlation which would indicate infiltration of the sanitary sewers. The information collected for a six year period indicates that storm water certainly is a major component of the total flows in the sanitary sewers. Refer to histograms in Appendix 2-1 and the table in Appendix 2-2. The dilute nature of the raw influent sewage (see appendix 3-1)

further indicates that infiltration is contributing to the sewage flow. Raw sanitary sewage normally has a B.O.D. ranging between 150 mg/l and 250 mg/l. It is to be expected that storm water is a major component of the sanitary collectors as they were installed in the late 1940's.

Histograms (Appendix 2-1) have been prepared to show the relationship between the sewage flows and the precipitation for the years 1973 to 1977. The monthly sewage flow data for this period has been summarized in Appendix 2-2. This information has been calculated utilizing a pump timer, rather than being a direct read out from a meter. An explanation of the calculation is contained in Appendix 3-2. The precipitation data contained in Appendix 2-3 has been obtained from the Meterological station at the Earlton Airport.

The histograms for the sewage flows and precipitation show a fairly strong correlation. It appears that the frost condition and the moisture content of the soil are the two major factors which affect the correlation, and therefore must be taken into consideration.

Since the precipitation received during the winter months (November-March) is in the form of snow it does not percolate into the soil until the spring thaw. Once the thaw takes place the five months accumulation of precipitation is free to saturate the soil and raise the groundwater table resulting in the water gaining entry to the sanitary sewers. This infiltration is shown up by the high sewage flows usually during the period of April-June. After the thaw has taken place and the soil is saturated it takes from about mid-May to the end of June for the groundwater table to be lowered to a point where it will not affect the sanitary collectors. This factor accounts for the elevated sewage flows during June. During July-September the precipitation does not have a marked effect upon the sewage flow, as the lower groundwater table enables the precipitation to percolate through the receiving soil to a point where it will have little effect upon the sanitary collectors.

The precipitation during the fall (September to mid-November) is usually constant except for the years 1974 and 1976. In both of these cases a marked increase in the precipitation in September showed a corresponding increase in the sewage flows.

It will be noted that with the 1974 data there is a time lag between the high precipitation seen in September to the high sewage flows experienced in October. This can be explained based upon the fact that the precipitation initially received shows only a slight increase in the sewage flows because most of the precipitation is percolating and raising the groundwater table. During the month of October the sanitary sewers are acting to lower the groundwater table.

This correlation between sewer flows and rainfall indicates that an extensive infiltration study should be carried out in an attempt to reduce the hydraulic flow to the treatment plant.

B) Sewage Treatment Plant

Sewage is gravity fed to the pollution control plant at the corner of Ninth and Commissioner Streets, adjacent to the lake. Under normal flow conditions all wastes entering the collector system are directed to the treatment plant. However, under peak loading, such as spring runoff or heavy rainfall, it is necessary to by-pass the plant and direct the wastes into the lake without screening or chlorination.

The Sewage Treatment Plant was built in 1948 to provide primary treatment of the sewage waste. After treatment the effluent is discharged into Spoon Bay through a 12" diameter pipe. There is no direct flow metering of the sewage influent or effluent. The flow data in Appendix 3-2 has been derived by visually recording the duration, each lift pump operates during a 24 hour period. The time of operation is then multiplied by the actual capacity of the respective pump to evaluate the daily flow in gallons. Quality of the sewage plant effluent was determined by a series of grab samples. Results show that the plant effluent does not consistently meet the required levels of suspended solids and B.O.D. reduction, (Refer to Appendix 3-1) set for primary sewage treated effluent. It is common for a primary sewage treatment plant to remove between 30-40% of the influent B.O.D. and between 40-60% of the influent suspended solids. In conventional sewage treatment very little nitrogen and phosphorus are removed, although they may change form chemically. It can be seen from the information in the appendix that there is not sufficient analytical data to realistically evaluate the treatment efficiency of the existing facility. Greater frequency of sampling will be necessary to achieve this end.

C) Unsewered Area

(Refer to Appendix 1-1 - 1 for Map showing the unsewered area)

The unsewered area in Larder Lake consists of 94 dwellings with a combined population of approximately 273 persons (according to our door-to-door survey). Where the lot area is sufficient for a septic tank/ tile field installation the predominate rock and clay soil conditions usually make such an installation very difficult and expensive. In most cases the small lot sizes restrict the installation of adequate septic tank/tile field systems. As a result the people of this area use other methods of sanitary disposal (See Appendix 4 for documentation and survey technique). Most residences have septic tanks without tile field systems which were installed by the town's work department. These systems have basically three different types of effluent disposal. For the sake of simplicity the unsewered area was broken down according to these three different methods of discharge:

1) From septic tanks to communal ditches, pipes, or culverts.

2) From septic tanks to private ditches, pipes or culverts.

3) From septic tanks to street ditches at the front of homes.

There were very few other types of sanitary disposal systems which did not fall into one of the above categories. Among the other systems there were 6 septic tanks with tile fields of which only four appeared to be acceptable.

The effluent from the faulty systems or those lacking tile fields eventually gains entry to the main creek and the lake or in some cases directly to the lake depending upon the location of the system.

1) <u>Effluent to Communal Ditches, Pipes or Culverts</u>

There are four separate areas in this classification.

(a) The block between 6th and 7th Avenue and between Ontario and Commissioner Streets has a communal pipe between the two rows of houses. The effluent from eight septic tanks enters this communal pipe which drains into the main creek.
A bacteriological sample indicates that as the communal pipe flows west, it discharges raw sewage into the main creek. (See Appendix 1-1 Sample pt. B 25 and Appendix 4-2 for the bacteriological result).

(b) The second area is between 5th and 6th Avenue and between Ontario and Commissioner Streets. There are five houses in this area which discharge their septic tank effluent into an open galvanized half culvert which flows west to the main creek.

A bacteriological sample taken at the culverts point of entry to the main creek was indicative of raw sewage (See Appendix 1-1 sample pt. B 24 and Appendix 4-2 for the bacteriological results).

c) The third area was between 4th and 5th Avenue between Ontario and Commissioner Streets. The septic tank effluent from four homes discharged into an open ditch to the south of the houses. The effluent flows west and enters the main creek. A bacteriological sample taken in this ditch reveals that raw sewage is being discharged into the creek. (See Appendix 1-1 sample pt. B 21 and Appendix 4-2 for the bacteriological results).

d) The fourth area which has a communal ditch is between 3rd and 4th Avenue and between Ontario and Commissioner Streets. There are four homes which discharge their effluent into this open ditch. A bacteriological sample taken near the east end of the ditch, as it flows west towards the main creek, indicates the presence of raw sewage (See Appendix 1-1 sample point No. B33 and Appendix 4-2 for the bacteriological results). Another sample taken at location No. A 12 confirms the presence of raw sewage.

All four of these communal discharge systems have been found to contain raw sewage and flow west to enter the main creek. A total of 21 residences utilize one of the above four communal discharges.

2) Discharge to Private Ditches, Pipes or Culverts

There are 19 septic tanks which discharge their effluent into private pipes, ditches or culverts, which lead to the main creek or lake. Bacteriological samples taken at the entry points of these to the main creek or lake confirm the fact that raw sewage is being discharged from these 19 buildings. (See locations on following page).

3) Discharge to Street Ditches

There are 53 dwellings which discharge effluent directly to street ditches in front of buildings and which eventually drain to the creek or the lake. Bacteriological samples taken in these street ditches and at their entry points to the creek or lake indicates that raw sewage is being discharged from the adjacent dwellings.

(See locations outlined in Table Titled "Discharge to Street Ditches" in the following pages).

C. UNSEWERED AREA (Cond't)

2) Discharge to Private Ditches, Pipes or Culverts

Address	Method of Discharge	Direction of Flow	Sample No.	Total Coliform	Fecal Coliform
197 8th Ave.	Ditch	East			
212 8th Ave.	Pipe	East			
208 8th Ave.	Pipe	East	B30	>80,000	>12,000
189 7th Ave.	Pipe	West			
208 7th Ave.	Pipe	West			
223 7th Ave.	Ditch	East			
232 7th Ave.	Pipe	East	B27	>80,000	>12,000
229 6th Ave.	Pipe	East	A32	>80,000	>12,000
232 6th Ave.	Ditch	East			
Separate School	Pipe	Southwest	A13	3,000 9,000 5,000	1,000 5,000 5,000
42 Ont. St.	Ditch	West	B14	>80,000	>12,000
48 Ont. St.	Ditch	West	B14	>80,000	>12,000
54 Ont. St.	Ditch	West	B14	>80,000	>12,000
Golden Anchor Motel	Pipe	West	B13	>80,000 >80,000	>12,000 >12,000
13 2nd Ave.	Pipe	East	A24	5,000	200
29 2nd Ave.	Ditch	East	A29	600	40
Lot 558 1st Ave.	Culvert	South	A21	8,000	8,000
21 3rd Ave.	Pipe	East	A28	3,400	800
321 Thompson Blvd.	Pipe	South	-	-	-

C. UNSEWERED AREA

3. Discharge to Street Ditches

Location	Houses	Flow	Sample No.	Result
Eight Ave. between Ontario & Commissioners Street	a) 231, 227, 213 205,	East to main creek	B34	Sewage present
	b) 220	East to main creek	B29	Sewage present
Seventh Ave. between Ont. & Commissioners Street.	a) 194, 190	West to main creek		
	b) 227	East to main creek		
Fourth Ave. between Ont. & Commissioners Street	226,224,200 194, 184 (100 Commissioners)	West to main creek	A12 B19	Sewage present Sewage present
Third Ave. between Ont. & Commissioners Street	240, 194	West to join ditch on Ont. St. which flows to main creek	Dry	
Ontario St. between Second & Third Ave.	61, 65, 69, 83	South to join the main creek	B11 B12	Sewage present Sewage present
Second Ave. between Ont. & Commissioners St.	a) 217, 197, 195	West to join ditch on Ont. St. which flows to main creek	B9	Sewage present
	b) 236, 204		B10	Sewage present
Government Rd. between Ont. & Commissioners St.	a) 211, 197	West to join ditch on Ont. St. which flows to the main creek		
	b) 186, Bodicks	Flow west along Government Rd. then south to the ditch on Ont. St. which flows south to join the main creek	B3	Sewage present

C. UNSEWERED AREA Discharge to Street Ditches (Cond't)

Location	Houses	Flow	Sample No.	Result
Government Rd. West of Ontario Street.	a) 308, 298, 286 Twp. Garage	South across Government Rd. to join the main creek	A14 B5 B4	Sewage Present Sewage Present Sewage Present
	b) 319, 317	East to join the main creek	A15 B6 B13	Sewage Present Sewage Present Sewage Present
	c) Texaco Garage 273, Andersons	West to join the main creek	B7	Sewage Present
Second Ave. East of Market St.	a) 48, 46, 42, 26 22, 12, 10, 8, 4	East to cross road and then south and east into the lake.	A16 A17 A18 A19 A20 A21	Sewage Present Sewage Present Sewage Present Sewage Present Sewage Present Sewage Present
	b) 35, 31	East to lake	A26 A24	Sewage Present Sewage Present
Third Ave. east of Market St.	29	East to lake	A27	Sewage Present

WATER QUALITY

A) CREEK ANALYSIS

B) LAKE ANALYSIS

WATER QUALITY - PART A

Creek Analysis

A chemical and bacteriological analysis of the main creek flowing through Larder Lake was conducted on June 14 by four members of the Ministry staff. Six sampling stations were located on the creek from a point just north of Highway #66 to where it enters Spoon Bay. The purpose of these sampling points was to determine the degree of change in the water quality as the creek flows through the built-up area.

Sample Point C-1

Sample Point C-1 was located north of Government Road (Highway #66) (See Appendix 5-2 for results). The creek at this point flows through a bush area, therefore it is assumed to be uncontaminated by domestic wastes. At this location the water of the creek had a low hardness, alkalinity, and chloride level which was characteristic of unpolluted water. Free ammonia, nitrate, and nitrite levels were also within the permissible level for surface water. B.O.D. levels were within the normal range for a creek of this size and velocity. Suspended solids and dissolved solids at this point in the creek indicate normal levels of organic and inorganic substance.
Refer to Appendix 5-1 for an explanation of the above chemical parameters.

All nutrient levels were within normal limits. At this point the creek has a high total coliform count, which is thought to be due to contamination through animal wastes and decaying vegetation. (Sample No. B36 and C-1). The high iron content is also assumed to be from a natural source.

Sample Point C-2

Sample point C-2 was located just south of Government Road, (See Appendix 5-2 for results). Domestic wastes from several homes and two garages empty into the creek at a point just upstream from where this sample was taken. At this location the water of the creek was of moderate hardness and alkalinity. There is a significant increase in the chloride concentration. This elevated level is probably a direct result of the salting operation which is carried out on the highway during the winter months. Elevated chloride levels may also indicate the presence of domestic sewage.

The dissolved solids level is one which is indicative of a medium strength sewage. The significant increase in the conductivity is probably a result of the increased dissolved solids.

The total kjeldahl nitrogen reading at this station (C-2) is significantly elevated above the previous station (C-1). This increase could be attributed to the nutrient loading resulting from the numerous discharges of raw human wastes to the creek.

This sample point exhibits the highest phenolic level of all the stations sampled. This level is assumed to be due to the presence of a garage near the sample point which may have discharged wastes into the creek. The coliform levels at this point were greater than 80,000 total coliform, which is a further indication of the presence of untreated domestic sewage.

The phosphorous level of the creek is elevated at this point, probably as a direct result of the discharge of untreated waste water.

Sample Point C-3

The sample Point C-3 was taken further south along the creek where an overflow pipe from the Catholic Separate School's septic tank and tile bed dumps human waste into the creek. (See Appendix 5-2 for results).

A bacteriological test taken at the entry of this effluent to the creek indicates a total coliform level of 9,000 organisms (Sample No. C-3) There seems to be some dilution at this point in the creek probably as a result of the dilute nature of the waste water discharged from the school.

The chloride, sodium, potassium, and calcium levels are slightly increased; which is expected as a result of the additive effect of additional domestic sewage.

There is a small increase in the nitrite and nitrate levels at this point. The addition of new waste is probably responsible for this slight increase in the nitrite level. The increased nitrate level indicates the age of the sewage as it has been produced by the oxidation of nitrite.

Dissolved solids, suspended solids, and conductivity are much higher which is also due to the additive effect of further sewage input to the creek.

This sample point exhibited the highest iron levels of all the sample points. There does not appear to be an explanation for this finding.

Sample Point C-4

The sample Point C-4 was located at the corner of Ontario Street and Fourth Avenue where the creek flows southeast through culverts across Ontario Street. (See Appendix 5-2 for results).

Additional sewage is being discharged to the creek from the ditches along Ontario Street, Fourth Avenue, Second Avenue, and Third Avenue. Raw untreated domestic sewage from approximately 23 homes is added to the creek in this area.

The hardness of the water at this point in the creek is considered to be in the medium range. The alkalinity, however has a measure which is characteristic of strong sewage. Chlorides, sodium, potassium, phosphorus, and calcium levels are up from the last point. The increase is assumed to be due to the further addition of raw domestic wastes.

Total kjeldahl and free ammonia reaches a maximum at this sample point. Dissolved solids and conductivity are higher, which is to be expected when there is an increase in elements such as chloride, sodium, and calcium.

Iron levels are down from the last sample point. Free ammonia and kjeldahl levels are higher here than nitrites and nitrates, indicating a more recent discharge of sewage. The bacteriological sample taken at this point showed total coliform organisms greater than 80,000 and faecal coliform greater than 12,000, which is indicative of untreated waste.

Sample Point C-5

Sample Point C-5 is located where the creek flows south-east across Sixth Avenue. (See Appendix 5-2 for results). At this point an additional 12 homes discharge their domestic wastes into the creek.

The hardness of the water is still in the medium range with the alkalinity being at a level which is characteristic of strong sewage.

Ammonia levels have dropped from that measured at the station upstream (C-4); but the nitrites and nitrates have significantly increased, thus indicating the relative age of the waste as compared to the sample point immediately upstream.

There is also an increase in dissolved solids which is to be expected since there is an increase in the chloride levels. The bacteriological test gave a reading of total coliform greater than 80,000 and a faecal coliform greater than 12,000 which is indicative of raw sewage. (Sample No. B35).

This sample point exhibits the highest degree of pollution of the creek, in that the grab sample reflects the additive effects of all the pollutants discharged upstream. This point is located far enough upstream that dilution from the lake has not affected the concentration of the parameters measured, as was the case with Sample C-6.

Sample Point C-6)

Sample Point C-6) is located in the creek just before it enters the lake. (See Appendix 5-2 for results). Because of the proximity of the sample point to the lake, the results showed signs of dilution, by comparison to the previous station. Despite this dilution, the bacteriological test indicated counts of greater than 80,000 total coliform and greater than 9,800 faecal coliform which shows the presence of sewage.

Discussion

The six sample points located throughout the course of the main creek shows the deteriorating quality of the creek water at this point in time. It must be clarified that the data collected can be used primarily as a relative measure of the impairment from one location to the other, rather than an absolute indication of the condition of the receiving stream. In order to arrive at a more accurate measure of the water quality, composite rather than grab samples, should be collected over an extended period of time.

Part B

Water Quality

Lake Survey

The actual lake survey was conducted on June 22 by 3 members of the Northeastern Region of the Ministry of the Environment staff. This work was supplemented by an entire lake survey carried out by our Technical Support section from Sudbury.

Our part of the survey entailed the sampling at seven stations located in the west section of the lake. Three measurements and seven chemical samples were taken at each station. The measurements included a secchi-disc depth, and a temperature, dissolved oxygen reading at one meter below the surface. The samples taken provided for the analysis of heavy metals, a phenol, cyanide and the routine chemical parameters. A bacteriological sample was also taken for each station, at a depth of one meter below the surface. (See Appendix 6 for results and sample point locations).

The survey conducted by our Technical Support section was similar to the District staff survey in that many sample points in the western portion of the lake were duplicated. In general the Technical Support survey was of a broader scope in that it evaluated the entire lake. Phosphorus sampling taken during the spring and fall enabled the survey team to evaluate the trophic status of the lake.

All of the samples and measurements were taken in an attempt to evaluate the water quality of the lake and to serve as a data base, to which future analysis can be compared. Without such a data base it is difficult to determine if the water quality of the lake is undergoing any change.

The lake survey was conducted to see what effect the Town had on the water quality of Spoon Bay, which is located in the northwest section of Larder Lake.

Bacteriological sampling indicates that the water quality of the Bay is showing signs of impairment. The highest bacteria counts were obtained 300 feet from the creek's point of entry into the Bay. None of the samples taken at this time exceeded our limits of 1000 Total Coliform/100 Faecal Coliform set for water to be used for recreational purposes. In the past the Timiskaming Health Unit has periodically sampled the shoreline of the Government beach to see whether the water is safe for swimming. At times the levels have been found to exceed our limits. It has been noted that the bacteriological counts fluctuate depending upon the direction of the wind.

The counts are the highest when the wind is blowing out of the south or southwest. This can be explained as it is probable that the bacteria in the sewage plant effluent and the bacteria in the creek, are being directed toward the beach.

The beach area should be continuously sampled throughout the summer months to monitor the bacteriological levels. If these levels exceed the limit set for recreational use then the beach should be closed and posted to indicate no swimming.

As mentioned above our Technical Support Section carried out a springtime phosphorus determination at various locations throughout the lake. The purpose of such sampling was to determine in what level to categorize the lake.

The phosphorus sampling indicated that the lake fit into level 2 of a possible 4 levels ranking. A level 2 lake is described as follows; good water quality. "Spring phosphorus concentrations from 9.9 to 18.5 mg/m^3. Lakes in this category are suitable for all forms of recreational use including boating, fishing and swimming; however, the preservation of a cold water fishery

may not be possible due to reduction of oxygen in the bottom waters by bacterial oxidation of sedimented organic material. Level 2 lakes are moderately productive and less clear than level 1 lakes".

In addition to the phosphorus determination, the Technical Support report goes on to describe the other samples and measurements taken during the summer of 1977.

In the discussion of the report the effect of the Town upon the Bay is mentioned. "The effect of the effluent discharge on this shallow Bay was evident during the September sampling when dense growths of aquatic macrophytes were observed in the area of the (sewage plant) discharge. In addition, slightly higher concentrations of springtime phosphorus were detected in this Bay during the initial sampling".

It appears from this sampling that Spoon Bay is showing signs of impairment. This deterioration of the water quality can be related to the sewage disposal practices carried out in the Town.

SUMMARY

The survey carried out during the summer of 1977 shows the degree of the servicing inadequacies within the Town.

Despite the fact that 75% of the Town is serviced by a municipal sanitary sewer, there are serious problems associated with both the collection system and the treatment facility.

The infiltration of the sanitary collectors is sever during the spring runoff conditions and prolonged heavy rainfalls experienced during the summer months. On a day-to-day basis it can be seen that the sewage flow greatly increases in response to prolonged rainfall. This rapid increase in the flow indicates that the storm water is quickly making its way into the collectors, thus suggesting that roof drains and sump pumps are connected to the sanitary sewers.

The analysis of the influent and effluent samples taken at the plant indicate that the treatment does not always meet our objectives. It appears that the plant will have to be expanded particularly if collectors are installed to service the unsewered areas.

The unsewered areas, consisting of 94 dwellings, discharge their domestic sewage waste to ditches, culverts and pipes which eventually discharge into the creek or directly into the lake. The analysis of the creek shows a marked impairment of the water quality as the creek flows through the built up area to the lake. During the fall when the water levels in the creek are low there are strong sewage odours associated with the ditches and the creek.

The discharges from the inadequate septic system which finally gain entry to the lake, show marked effects on the water quality of Spoon Bay. The lake survey revealed a dense growth of aquatic macrophytes in the Bay. It was also determined that the phosphorus levels in the Bay were slightly higher than for other locations in the lake.

These water quality findings indicated that the sewage treatment practices carried out in the Town are having a deleterious effect upon the water quality of the Bay.

Up until the present there have been no reports of any serious health effects associated with the high bacteriological levels in the creek and ditches of the unsewered areas.

These areas should be posted to inform the public of the possible health hazard, particularily to the children who attend the schools in this area.

RECOMMENDATIONS

1) A revised Management by Results (M.B.R.) questionnaire should be completed by the District staff based upon the finding of this survey. The M.B.R. should be forwarded to the Ministry Project Co-ordination Section so that a committment can be made to proceed with the project.

2) The unsewered areas within the community should be serviced with communal collector sanitary sewers.

3) The sewage treatment facility should be expanded to provide primarily treatment for the waste collected from the entire community. The design of the expanded facility should take into consideration the eventual need for nutrient removal.

4) An in-depth infiltration study should be carried out of the major sanitary collectors. The purpose of such a study is to indicate where storm water is gaining entry to the sanitary sewers.

5) The connection of roof and foundation drains to the sanitary sewers should be prohibited by means of a municipal By-law.

6) Ditches, culverts and other drainage systems should be cleaned routinely to facilitate runoff and minimize the effects of infiltration of the sanitary collectors.

7) A draw-down test of the sewage wet well should be performed by the installed pumps to confirm the actual capacity of each pump.

8) Routine monthly influent and effluent sewage samples should be collected by the operator and be submitted to our laboratory for analysis.

9) The point of chlorination at the treatment plant should be changed from the wet well to the effluent weir to provide more thorough disinfection during the summer months.

10) Flow metering should be installed at the water works pump house in order to determine the per capita water use, which can be related to the sewage flow. The difference in flows is usually a result of infiltration.

11) A routine program of bacteriological sampling of the beaches during the summer months should be carried out to ensure the water is "safe" for recreational use.

12) A bacteriological sampling program should be set up for the Town creek. If the total and faecal coliforms routinely exceed 1000/100 organisms respectively then the creek should be posted to inform the public that the water is "unsafe".

13) A "self help" program should be initiated in order to monitor the water quality in Spoon Bay during the ice free period of the year.

APPENDIX 1

1-1 Town Map

APPENDIX 2

2-1 HISTOGRAM

Sewage Flows vs. Precipitation

2-2 TABLE OF SEWAGE FLOW DATA

1973-1977

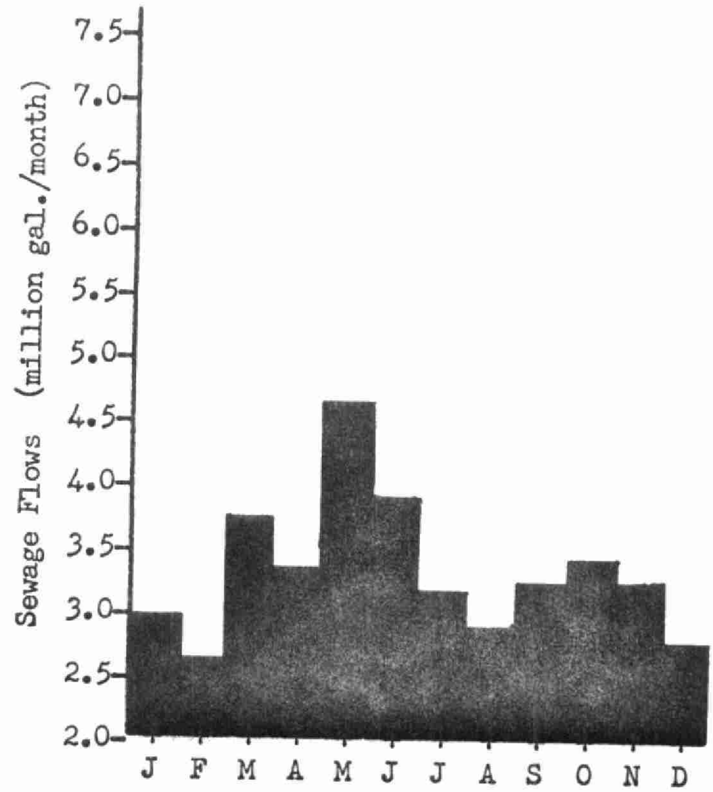
2-3 TABLE OF PRECIPITATION DATA

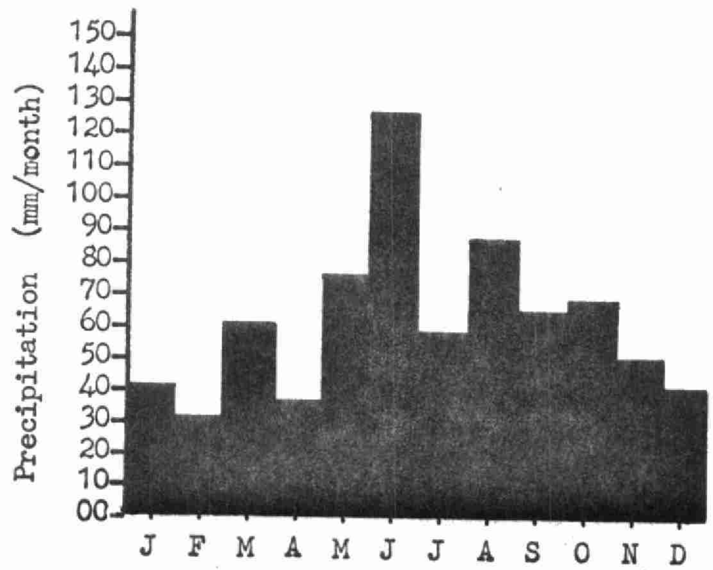
1973-1977

APPENDIX 2-1

HISTOGRAM

Sewage Flows vs. Precipitation 1973

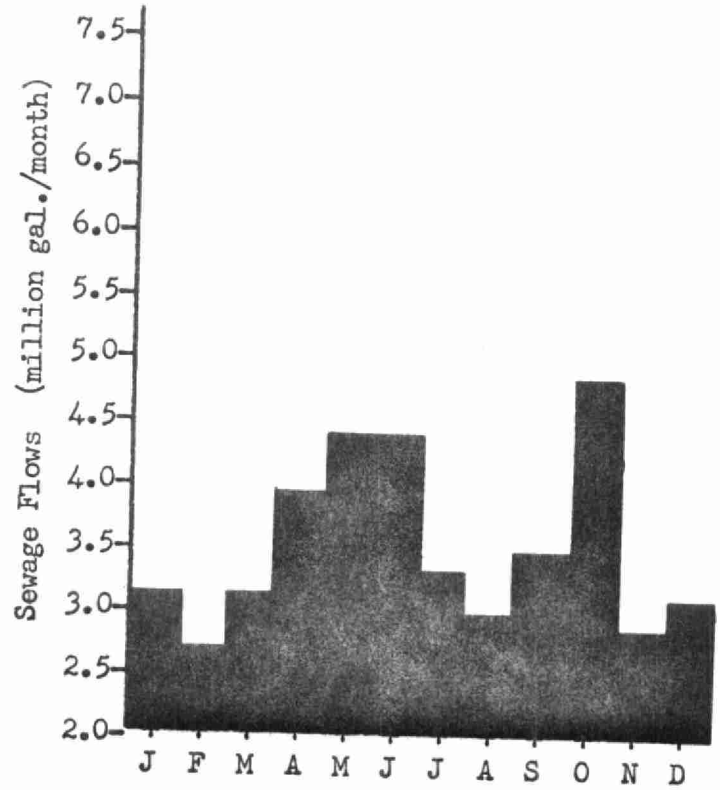


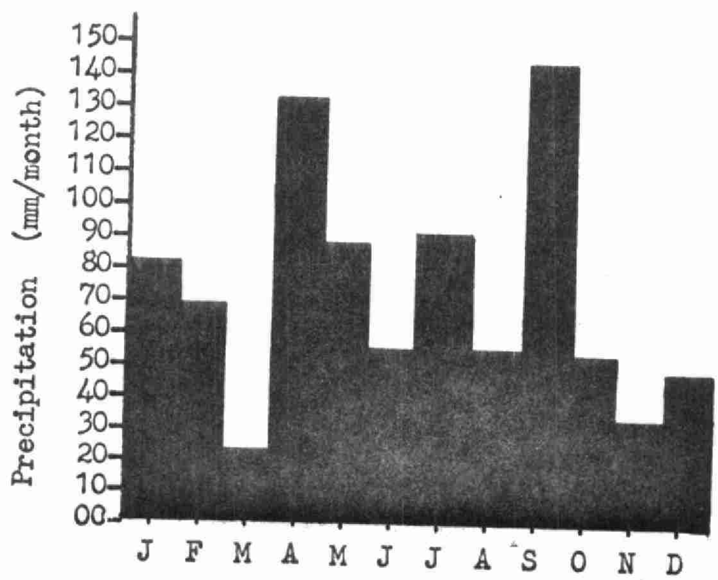


APPENDIX 2-1

HISTOGRAM

Sewage Flows vs. Precipitation 1974

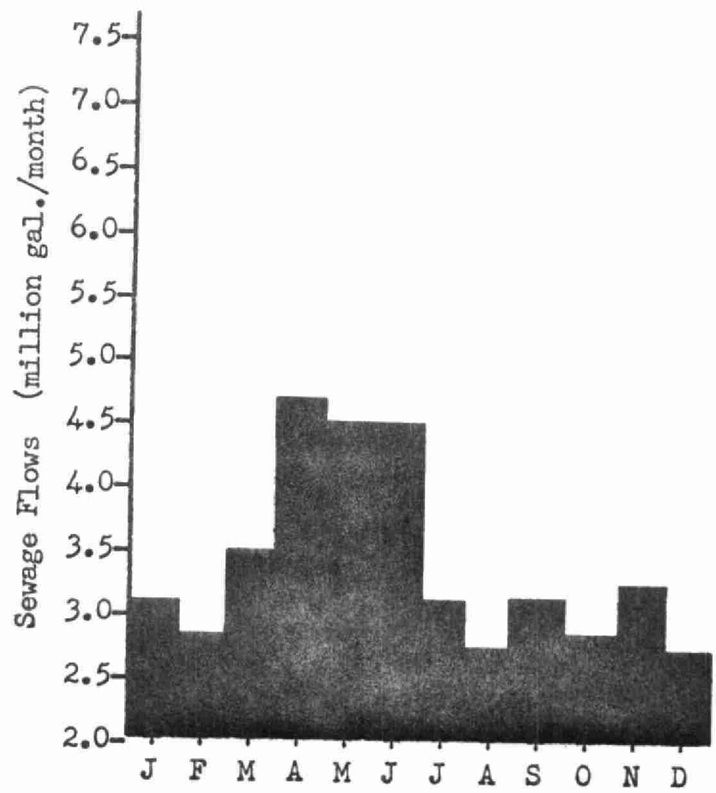


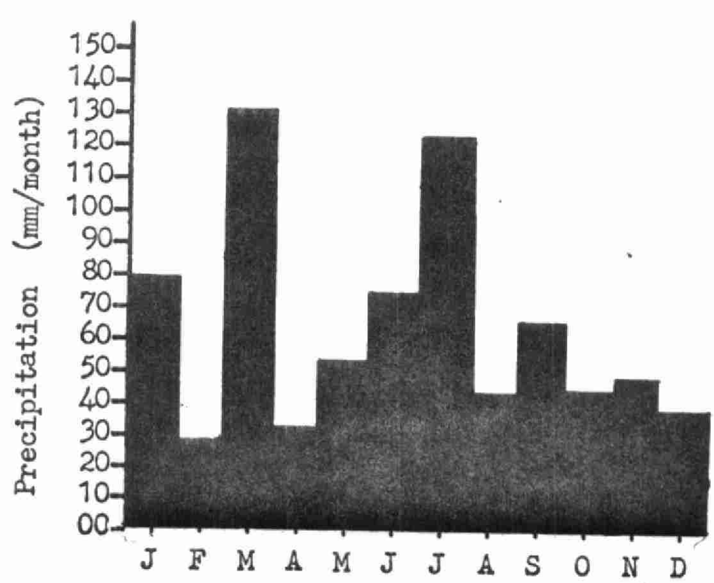


APPENDIX 2-1

HISTOGRAM

Sewage Flows vs. Precipitation 1975

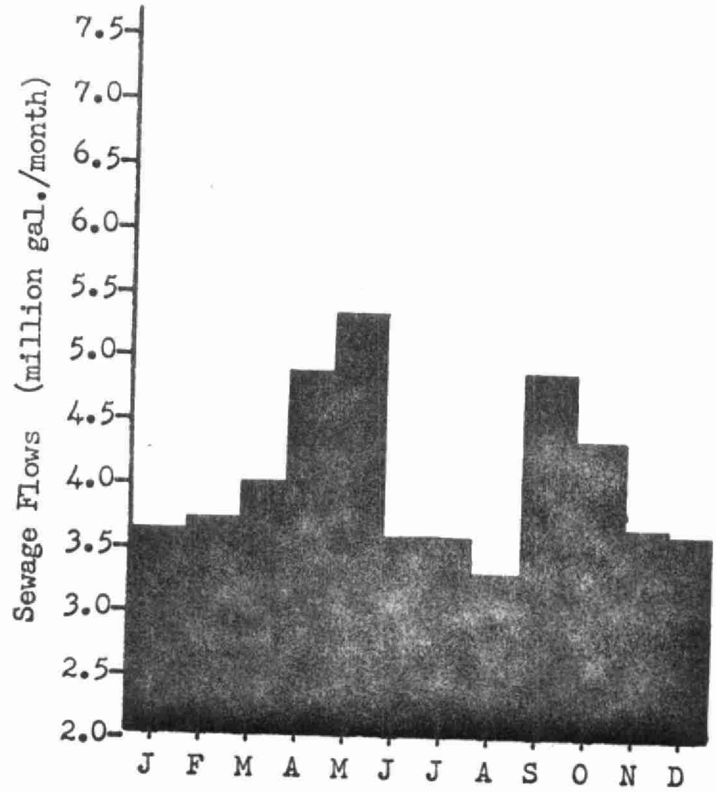


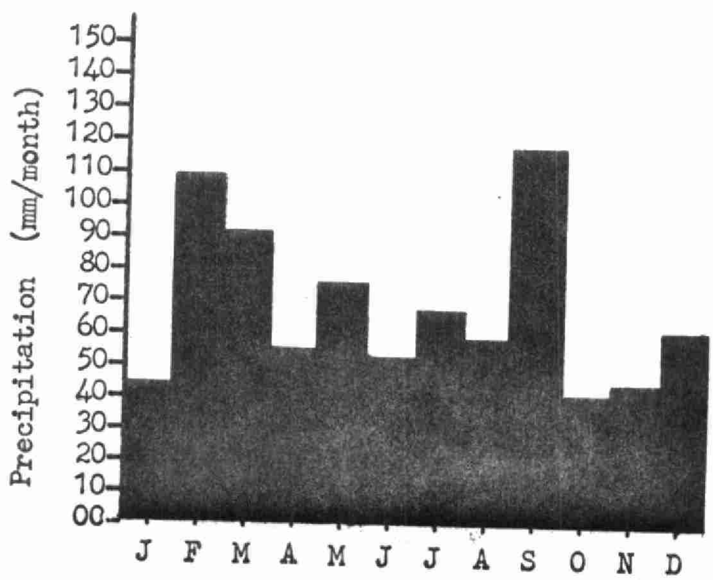


APPENDIX 2-1

HISTOGRAM

Sewage Flows vs. Precipitation 1976

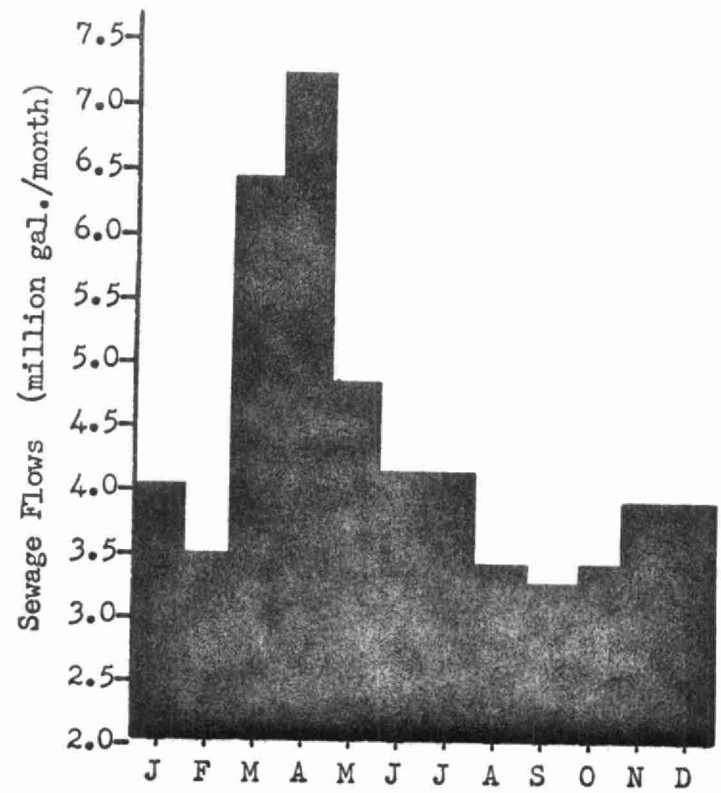


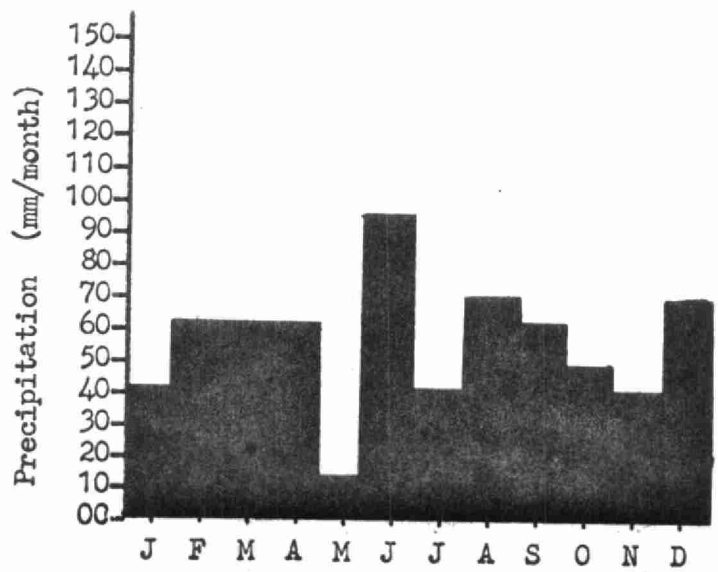


APPENDIX 2-1

HISTOGRAM

Sewage Flows vs. Precipitation 1977





APPENDIX 2-2

SEWAGE FLOW DATA 1973 - 1977

	1973 Total Monthly Flows Gal/mo.	1974 Total Monthly Flows Gal/mo.	1975 Total Monthly Flows Gal/mo.	1976 Total Monthly Flows Gal/mo.	1977 Total Monthly Flows Gal/mo.
January	3,021,000	3,142,000	3,193,400	3,646,000	4,046,000
February	2,637,000	2,741,000	2,915,400	3,757,000	3,565,000
March	3,741,000	3,144,000	3,915,400	4,028,000	6,414,000
April	3,397,000	3,983,600	4,700,500	4,930,000	7,222,000
May	4,745,600	4,410,000	4,581,000	5,453,000	4,321,000
June	3,945,000	4,465,000	4,541,000	3,643,000	4,143,000
July	3,209,000	3,381,400	3,121,500	3,645,000	4,174,000
August	2,976,600	3,013,200	2,839,000	3,412,000	3,426,000
September	3,378,000	3,506,600	3,246,000	4,897,000	3,328,000
October	3,514,000	4,784,000	2,933,200	4,447,500	3,506,000
November	3,321,000	2,885,000	3,301,000	3,735,000	3,872,000
December	2,815,200	3,193,400	3,698,500	3,703,000	3,890,000

APPENDIX 2-3

PRECIPITATION DATA 1973-1977

	1973 mm/month	1974 mm/month	1975 mm/month	1976 mm/month	1977 mm/month
January	41.4	83.6	79.3	45.9	42.3
February	32.8	70.1	29.2	109.7	63.0
March	63.5	24.9	133.1	92.8	64.2
April	37.1	103.6	34.5	56.4	65.2
May	79.8	90.0	54.9	77.1	16.8
June	128.3	58.9	77.7	55.3	97.5
July	59.7	92.2	125.0	69.8	43.7
August	90.4	57.7	46.0	59.6	72.0
September	67.3	143.6	67.9	119.1	64.9
October	70.6	55.6	47.2	42.0	51.5
November	53.1	35.3	51.1	48.2	43.9
December	43.4	50.8	39.9	59.7	70.2

Note: - This Precipitation Data was obtained for the Meterological station located at the Earlton Airport which is approximately 28 miles (air) south, southwest of Larder Lake

APPENDIX 3

3-1 PLANT EFFLUENT QUALITY

3-2 SEWAGE FLOW DATA
1973-1977

APPENDIX 3-1

Plant Effluent Quality

Date	B.O.D. mg/l	Suspended Solids mg/l	Total Kjeldahl Nitrogen mg/l	Total Phosphorus mg/l
Jan. 1974				
Influent	100	100	59	6.8
Effluent	46	35	19	2.4
% Removal	54%	65%		
Feb. 1974				
Influent	170	360	98	10
Effluent	17	25	19	2.3
%Removal	90%	93%		
May 1974				
Influent	38	50	30	3.2
Effluent	15	25	12	1.5
%Removal	60%	50%		
July 1974				
Influent	50	70	37	4.4
Effluent	11	15	16	2.1
% Removal	78%	78%		
Nov. 1974				
Influent	150	230	63	6.7
Effluent	36	110	21	3.6
% Removal	76%	52%		
March 1977				
Influent	85	110	20	5.3
Effluent	60	44	12	3.8
% Removal	29%	60%		
April 1977				
Influent	95	220	13	1.7
Effluent	75	65	18	1.8
% Removal	21%	70%		
June 1977				
Influent	130	85	23	4.8
Effluent	55	30	17	2.8
% Removal	58%	65%		

APPENDIX 3-2 - SEWAGE FLOW DATA

	1973 Total Monthly Flows Gal/Month	1973 Average Daily Flows Gal/Day	1973 Maximum Daily Flows Gal/Day
January	3,021,000	97,541	126,000
February	2,637,000	94,178	110,000
March	3,741,000	120,677	162,000
April	3,397,000	113,233	159,000
May	4,745,600	153,083	219,000
June	3,945,000	131,500	240,000
July	3,209,000	103,516	149,000
August	2,976,600	96,019	124,000
September	3,378,000	112,600	187,000
October	3,514,000	113,354	170,000
November	3,321,000	110,700	144,000
December	2,815,200	90,812	108,000

Total Yearly 40,699,800

Average Month 3,391,650

APPENDIX 3-2 (Cond't)

SEWAGE FLOW DATA

	1974 Total Monthly Flows Gal/Month	1974 Average Daily Flows Gal/Day	1974 Maximum Daily Flows Gal/Day
January	3,142,000	101,355	121,000
February	2,741,000	97,893	132,000
March	3,144,000	101,419	138,000
April	3,983,600	132,787	258,000
May	4,410,000	142,258	240,000
June	4,465,000	148,833	212,000
July	3,381,400	109,077	194,000
August	3,013,200	97,200	156,000
September	3,506,600	116,887	182,000
October	4,784,000	154,000	265,000
November	3,790,000	126,333	225,000
December	2,885,000	93,071	107,000

Total Yearly	46,439,200
Average Month	3,869,933

APPENDIX 3-2 (Cond't)

SEWAGE FLOW DATA

	1975 Total Monthly Flows Gal/Month	1975 Average Daily Flows Gal/Day	1975 Maximum Daily Flows Gal/Day
January	3,193,400	103,000	121,000
February	2,915,400	104,121	127,000
March	3,575,400	115,335	168,000
April	4,700,500	156,680	420,000
May	4,581,000	147,774	310,500
June	4,541,000	151,366	216,000
July	3,121,500	100,677	180,500
August	2,839,000	91,581	108,000
September	3,246,000	108,200	168,000
October	2,933,200	94,619	119,000
November	3,301,000	110,033	158,000
December	3,698,500	119,290	220,500

Total Yearly 46,439,200

Average Month 3,869,933

APPENDIX 3-2 (cond't)

SEWAGE FLOW DATA

	1976 Total Monthly Flows Gal/Month	1976 Average Daily Flows Gal/Day	1976 Maximum Daily Flows Gal/Day
January	3,646,000	117,613	144,000
February	3,757,000	129,552	140,000
March	4,028,000	143,100	312,000
April	4,930,000	174,500	336,000
May	5,453,000	176,000	215,000
June	3,643,000	117,500	144,000
July	3,645,000	117,600	187,000
August	3,412,000	110,060	144,000
September	4,897,000	163,733	325,000
October	4,447,500	143,451	184,000
November	3,735,000	124,500	177,000
December	3,703,000	119,451	139,000

Total Yearly	49,296,500
Average Month	4,108,041

APPENDIX 3-2 (Cond't)

SEWAGE FLOW DATA

	1977 Total Monthly Flows Gal/Month	1977 Average Daily Flows Gal/Day	1977 Maximum Daily Flows Gal/Day
January	4,046,000	130,516	165,000
February	3,565,000	127,321	138,000
March	6,414,000	206,903	489,000
April	7,222,000	240,733	450,000
May	4,321,000	139,387	188,000
June	4,143,000	138,084	240,000
July	4,174,000	134,630	211,000
August	3,426,000	110,520	134,000
September	3,328,000	110,920	274,000
october	3,506,000	113,010	144,000
November	3,872,000	132,850	220,000
December	3,890,000	125,480	183,000

Total Yearly 51,907,000

Average Month 4,325,583

Note: - Flow Data has been calculated by multiplying the pump totalizer by the actual capacity of each lift pump. The totals for each pump are added for each 24 hour period. Lift pump No. 1 has an actual capacity of 200 IGPM whereas Pump No. 2 has an actual capacity of 300 IGPM.

APPENDIX 4

4-1 Documentation of the Door-to-Door Survey

4-2 Bacteriological Results

4-3 Survey Technique

APPENDIX 4-1

Name	Address	# of Occu.	Sewage Disposal	Comment
M. Cormier	197 Eight Ave. Lot. No. 545, 546 - size 33'x99'	3	Septic tank without a tile bed 500 gal. tank. Effluent drains to the main creek by means of a ditch	Inadequate
J. Lorenzo	205 Eight Ave. Lot no. 548, 547 - size 66'x99'		Septic tank without a tile bed 450 gal. tank. Effluent to a street ditch then east to the main creek	Inadequate
M. Cormier	208 Eight Ave. Lot. No. 542, size 33'99'	3	Septic tank without a tile bed 600 gal. tank. Effluent drains into the main creek by mean of pipe	Inadequate
R. Blackburn	212 Eight Ave. Lot no. 543 & 542 size 66'x99'	6	Septic tank without a tile bed 600 gal. tank. Effluent drains into the main creek by means of a pipe.	Inadequate
M. Bourgeois	213 Eight Ave. Lot. no. 549 Size 66'x99'	4	Septic tank without a tile bed 500 gal. tank. Effluent to a street ditch and then it flows east to the main creek	Inadequate
L.P. Vachon	220 Eight Avenue Lot. no. 544 & 543 size 99'x99'	3	Septic tank without a tile bed - gal. tank. Effluent to a street ditch and then it flows east to join the main creek	Inadequate
G. Gagne	227 Eight Ave. Lot no. 550 size - 33'x99'	4	Septic tank without a tile bed 515 gal. tank. Effluent to a street ditch and then flows east to join the main creek	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comments
R. Harvey	231 Eight Ave. Lot. no. 550 size 33'x99'	7	Septic tank without a tile bed 575 gal. tank. Effluent to a street ditch and then flows east to the creek.	Inadequate
J. Marlow	189 Seventh Ave. Lot no. 533, size - 66'x99'	2	Septic tank without a tile bed 250 gal. tank. Effluent drains to the main creek by means of a pipe	Inadequate
M. Gould	190 Seventh AVe. Lot no. 526 size 33'x99	4	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the main creek	Inadequate
F. Jakner	194 Seventh Ave. Lot No. 528 size 33'x99'		Septic tank without a tile bed 500 gal. tank. Effluent drains to a street ditch, then west to creek.	Inadequate
L. Comtois	200 Seventh Ave. Lot no. 527 & 528, size 66'x99'	6	Septic tank without a tile bed 500 gal. tank. Effluent drains to a communal pipe at the back of the house, which drains west to the main creek	Inadequate
G. Young	204 Seventh Ave. Lot no. 528 size 33'x99'	3	Septic tank without tile bed 575 gal. tank. Effluent drains to a communal line at the back of the houses, which drains west to the main creek	Inadequate
R. Clermont	208 Seventh Ave. Lot no. 529 size 66'x99'	6	Septic tank without tile bed 500 gal. tank. Effluent drains to the main creek by means of a pipe	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
H. Green	223 Seventh Ave., Lot no. 537 size 33'x99'	5	Septic tank without a tile bed 575 gal. tank. Effluent drains to the main creek by means of a ditch	Inadequate
F. Mills	227 Seventh Ave. Lot. no. 538 size 66'x99'	2	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the main creek	Inadequate
A. Roddich	232 Seventh Ave. Lot. no. 531 size 66'x99'	3	Septic tank without a tile bed 500 gal. tank. Effluent drains to the main creek by means of a pipe	Inadequate
Letourneau	184 6th Ave. Lot. no. 513 size 33'x99'	4	Septic tank without a tile bed 500 gal. tank. Effluent drains to a communal galvanized culvert at the back of the houses and drains west to the main creek	Inadequate
A. Plante	188 Sixth Ave. Lot. no. 513 size 33'x99'	6	Septic tank without a tile bed 575 gal. tank. Effluent drains to a communal galvanized culvert at the back of the house and drains west to the main creek.	Inadequate
A. William	189 Sixth Ave. Lot. no. 519 size 33'x99'	7	Septic tank without a tile bed 575 gal. tank. Effluent drains to a communal pipe at the back of the house and drains west to the main creek.	Inadequate
N. Anthela	192 Sixth Ave. Lot. no. 514 size 33'x99'	2	Septic tank without a tile bed - gal. tank. Effluent drains to a communal galvanized culvert at the back and flows west to the main creek.	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
E. Litts	195 Sixth Ave., Lot. no. 520 size 33'x99'	4	Septic tanks without a tile bed 575 gal. tank. Effluent drains to a communal pipe behind the house and drains west to the main creek.	Inadequate
Y. Presseault	199 Sixth Ave. Lot no. 520 size 33'x99'	4	Septic tank without a tile bed 575 gal. tank. Effluent drains to a communal pipe at the back of the house and flows west to the main creek.	Inadequate
P. Champion	200 Sixth Ave. Lot no. 514 size 33'x99'	6	Septic tank without a tile bed 575 gal. tank. Effluent drains to a galvinized culvert at the back of the house and drains west to the main creek.	Inadequate
J. Boire	203 Sixth Ave. Lot no. 521 size 33'x99'	2	Septic tank without a tile bed 400 gal. tank. Effluent drains to a communal pipe at the back of the house and flows west to the creek	Inadequate
M. Lelievre	207 Sixth Ave. Lot no. 521 size 33'x99'	3	Septic tank without a tile bed 575 gal. tank. Effluent to a communal at the back of the house and flows west to the creek.	Inadequate
B. Butlin	209 Sixth Ave., Lot no. 522 size 33'x99'	7	Septic tank without a tile bed 600 gal. tank. Effluent drains to a communal pipe at the back of the house and flows west to the creek.	Inadequate
A. Veinot	229 Sixth Ave. Lot no. 524 size 66'x99'	2	Septic tank without a tile bed - gal. tank. Effluent drains east to the main creek by means of a pipe	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	# of Occu.	Sewage Disposal	Comment
Chisholm	232 Sixth Ave. Lot no. 516 size 33'x99'	5	Septic tank without a tile bed - gal. tank. Effluent drains east to the creek by means of a ditch.	Inadequate
Gosselin	181 Fifth Ave. Lot no. 505 size 40'x99'	2	Septic tank without a tile bed - gal. tank. Effluent drains to a street ditch and then west to join the main creek	Inadequate
Maille	184 Fourth Ave. Lot no. 452 size 40'x 90'	Not Known	Septic tank without a tile bed - gal. tank. Effluent drains to a street ditch and then west to join the main creek	Inadequate
Catholic Church	185 Fourth Ave. Lot no. 452 size 40'x125'	N/A	Septic tank without a tile bed - gal. tank. Effluent drains to a communal ditch behind the house and flows west to join the main creek.	Inadequate
R.Camirand	189 Fourth Ave. Lot no. 453 size 40'x99'	4	Septic tank without a tile bed 575 gal. tank. Effluent drains to a communal ditch at the back of the house and flows west to join the creek.	Inadequate
J.Sikorsky	194 Fourth Ave. Lot no. 425 size 40'x99'	3	Septic tank without tile bed 750 gal. tank. Effluent drains to a street ditch and flows west to the creek	Inadequate
W. Robats	200 Fourth Ave. Lot no. 427 size 40'x99'	2	Septic tank without a tile bed - gal. tank. Effluent drains to a street ditch and flows to the main creek	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	# of Occu.	Sewage Disposal	Comment
R. Jacques	217 Fourth Ave. Lot no. 458 size 40'x99'	3	Septic tank without a tile bed 575 gal. tank. Effluent drains to a communal ditch at the back of the house and flows west to the main creek.	Inadequate
E. Allan	221 Fourth Ave. Lot no. 459 size 40'x99'	6	Septic tank without a tile bed 200 gal. tank. Effluent drains to a communal ditch at the back of the house and flows west to the main creek.	Inadequate
Devereaux A.	224 Fourth Ave. Lot no. 429 & 430 size 80'x99'	3	Septic tank without a tile bed - gal. tank. Effluent drains to a street ditch which flows west to join the main creek.	Inadequate
O. Bettiol	226 Fourth Ave. Lot no. 431 size 40'x99'	2	Septic tank without a tile bed - gal. tank. Effluent drains to a street ditch which flows west to join the main creek	Inadequate
S. Bak	194 Third Ave. Lot no. 367 size 40'x140'	2	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows west to join the main creek.	Inadequate
C.Hutchinson	195 Third Ave. Lot no. 396 size 40'x99'	2	Septic tank without a tile bed 575 gal. tank. Effluent to a communal ditch at the back of the house and then flows west to the main creek	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comments
J. Mando	209 Third Ave., Lot no. 398 & 399 size 80'x99'	3	Septic tank without a tile bed 500 gal. tank. Effluent to a communal ditch at the back of the house and flows west to join the main creek.	Inadequate
Perrier	215 Third Ave. Lot no. 400 size 40'x99'	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to the communal ditch at the back of the house which flows west to join the main creek.	Inadequate
W. Maille	221 Third Ave. Lot no. 401 & 402 size 80'x99'	2	Septic tank without a tile bed 500 gal. tank. Effluent to a communal ditch at the back of the house which flows west to join the main creek.	Inadequate
Not Known	240 Third Ave. Lot no. size	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows west to join the main creek.	Inadequate
D. Powell	195 Second Ave. Lot no. 335 size 40'x134'		Septic tank without a tile bed 575 gal. tank. Effluent flows to a street ditch and then flows west to the creek	Inadequate
A. Duquette	197 Second Ave. Lot no. 336 size 40'x140'	2	Septic tank without a tile bed - gal. tank. Effluent flows to a street ditch which flows west to the main creek	Inadequate
F. Charron	204 Second Ave. Lot no. 313 size 66'x99'	2	Septic tank without a tile bed 575 gal. tank. Effluent flows to a street ditch which flows west to main creek	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
J. Cottrell	217 Second Ave. Lot no. 340 size 40'x164'	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows west to the main creek	Inadequate
Gauvin	236 Second Ave. Lot no. 317 size 33'x99'	2	Septic tank without a tile bed - gal. tank. Effluent flows to a street ditch and flows west to join the main creek.	Inadequate
Separate School	Ontario St.	100	Septic tank without a tile bed - gal. tank. Effluent overflows south into the main creek.	Inadequate
L. Bettiol	42 Ontario St. Lot no. 46 size 54'x99'	1	Septic tank without a tile bed - gal. tank. Effluent drains to the back of the house, flows west to main creek by means of a ditch.	Inadequate
L. Roberge	48 Ontario St. Lot no. 149 and Y2 of 46 size 54'x99'	2	Septic tank without tile bed 575 gal. tank. Effluent drains to the back of the house and flows west to creek	Inadequate
M. Schmidt	54 Ontario St. Lot no. 147 size 36'x99'	4	Septic tank without a tile bed 575 gal. tank. Effluent drains to a ditch at the back of the house and flows west to the main creek.	Inadequate
B. Gareau	61 Ontario St. Lot no. 144 size 40'x125'	5	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows south to join the main creek	Inadequate
B.Weisflack	65 Ontario St. Lot no. 143 size 40'x125'	4	Septic tank without a tile bed 625 gal. tank. Effluent drains into a street ditch and flows south to main creek.	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
S. Garzalcynski	69 Ontario ST. Lot no. 141 size 40'x125'	5	Septic tank without a tile bed 575 gal. tank. Effluent drains into a street ditch and flows south to the main creek.	Inadequate
T. Gauthier	83 Ontario St. Lot no. 135 size 40'x125'	7	Septic tank without a tile bed 575 gal. tank. Effluent drains into a street ditch and flows south to join the creek	Inadequate
D. Rousseau	186 Government Rd. Lot no. 297 size 120'x100'	7	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows west to join the main creek	Inadequate
H. Boucher	197 Government Rd. Lot no. 273 size 66'x99'	2	Septic tank without a tile bed 575 gal. tank.Effluent drains to a street ditch then flows west to Ont. St. then south to the main creek.	Inadequate
E. Clermont	211 Government Rd. Lot no. 275 size 66'x99'	5	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch then flows west to Ont. St. then south to the main creek.	Inadequate
P. Ouellette	230 Government Rd. Lot no. 304 size 120'x100'	3	Septic tank with a tile bed	Inadequate
J. Bodick	Government Rd. Lot no. 586 size 40'x105'	Not Known	Septic tank without a tile bed 600 gal. tank. Effluent drains to a street ditch and then flows west to join the main creek	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
Twp. Garage	Government Rd. Lot no. 588 & 589 size 80'x 210'	5	Septic tank without a tile bed 550 gal. tank. Effluent drains to a street ditch then flows west to join the main creek	Inadequate
B. Chaylt	273 Government Rd. Lot no. 153 size 36'x99'	8	Septic tank without a tile bed 600 gal. tank. Effluent drains to a street ditch then flows west to join the main creek	Inadequate
Not Known	286 Government Rd. Lot no. 590 size 45'x104'	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch then it flows west to join the main creek.	Inadequate
Texaco Garage Owner A Fick	Government Rd. Lot no. 608 & 609 size 200' x 110'	2	No septic tank. Effluent drains to a ditch at the side of the garage then into a street ditch then flows west to join the main creek.	Inadequate
Golden Anchor Motel	Government Rd. Lot no. size	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a pipe and then into the main creek	Inadequate
Not Known	Government Rd. Lot no. 591 size 40'x105'	Not Known	Septic tank without a tile bed 400 gal. tank. Effluent drains to a street ditch and then flows west to join the main creek	Inadequate
F. Anderson	Government Rd. Lot no. size	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to the main creek via a street ditch	Inadequate
P. Allan	308 Government Rd. Lot no 593 size 40'x105'	5	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and then flows west to join the main creek.	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	# of Occu.	Sewage Disposal	Comment
J. Audet	317 Government Rd. Lot no. size	4	Septic tank without a tile bed 600 gal. tank. Effluent drains to a street ditch then flows east to joint the main creek.	Inadequate
D. Allan	319 Government Rd. Lot no. size	6	Septic tank without a tile bed 575 gal. tank. Effluent drains into a street ditch then flows east to join the main creek	Inadequate
R. Marchant	321 Thompson Blvd. Lot no. 8 & 9 size 186'x66'	6	Septic tank with a tile bed Grey water goes to the lake	Inadequate
Lionel	289 Thompson Blvd., Lot no. 19 size 40'x86'	2	Septic tank with a tile bed	Adequate
E. Mason	314 Thompson Blvd., Lot no. 70& 71 size 100'x86'	2	Septic tank with a tile bed	Adequate
H. Kirboschek	316 Thompson Blvd., Lot no. 72 size 186'x66'	2	Septic tank with a tile bed	Adequate
E. Keith	13 Second Ave. Lot no. 342 size 60'x90'	1	Septic tank without a tile bed 500 gal. tank. Effluent drains to the lake by means of a pipe	Inadequate
I. Demers	29 Second Ave. Lot no. 342A size 25'x99'	1	Septic tank without a tile bed 500 gal. tank. Effluent drains to the lake by means of a small ditch	Inadequate
I. Demers	31 Second Ave. Lot no. 320, 321 & 322 size 99'x99'	3	Septic tank without a tile bed 500 gal. tank. Effluent drains to a street ditch and eventually to the lake	Inadequate
E. Brunner	35 Second Ave. Lot no. 323 size 33'x99'		Septic tank without a tile bed 575 gal. tank. Effluent drains to street ditch	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
E. Lepasti	4 Second Ave. Lot no. 250 Lot size 53'x9'	9	Septic tank without a tile bed 575 gal. tank. Effluent drains into a culvert and across the street to the lake	Inadequate
L. Karen	8 Second Ave. Lot no. 251 Lot size 33'x99'	1	Septic tank without a tile bed 200 gal. tank. Effluent drains to a street ditch and flows eventually to the lake.	Inadequate
L. Karen	10 Second Ave. Lot no. 252 Lot size 33'x99'	2	Septic tank without a tile bed 800 gal. tank. Effluent flows to a street ditch and flows east to the lake	Inadequate
L.Letourneau	14 Second Ave. Lot no. 253 Lot size 33'x99'	5	Septic tank without a tile bed 575 gal. tank. Effluent flows to a street ditch and flows east to the lake	Inadequate
M. Van Melle	22 Second Ave. Lot no. 254 size 33'x99'	2	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake	Inadequate
E. Lepasti	26 Second Ave. Lot no. 255 & 30 size 66'x99'	Not Known	Septic tank without a tile bed 800 gal. tank. Effluent drains to a street ditch and flows east to the lake.	Inadequate
A. Godmaire	42 Second Ave. Lot no. 32 size 33'x99'	7	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake.	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	#of Occu.	Sewage Disposal	Comment
E. Lepasti	4 Second Ave. Lot no. 250 Lot size 53'x9'	9	Septic tank without a tile bed 575 gal. tank. Effluent drains into a culvert and across the street to the lake	Inadequate
L. Karen	8 Second Ave. Lot no. 251 Lot size 33'x99'	1	Septic tank without a tile bed 200 gal. tank. Effluent drains to a street ditch and flows eventually to the lake.	Inadequate
L. Karen	10 Second Ave. Lot no. 252 Lot size 33'x99'	2	Septic tank without a tile bed 800 gal. tank. Effluent flows to a street ditch and flows east to the lake	Inadequate
L.Letourneau	14 Second Ave. Lot no. 253 Lot size 33'x99'	5	Septic tank without a tile bed 575 gal. tank. Effluent flows to a street ditch and flows east to the lake	Inadequate
M. Van Melle	22 Second Ave. Lot no. 254 size 33'x99'	2	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake	Inadequate
E. Lepasti	26 Second Ave. Lot no. 255 & 30 size 66'x99'	Not Known	Septic tank without a tile bed 800 gal. tank. Effluent drains to a street ditch and flows east to the lake.	Inadequate
A. Godmaire	42 Second Ave. Lot no. 32 size 33'x99'	7	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake.	Inadequate

APPENDIX 4-1 (cond't)

Name	Address	# of Occu.	Sewage Disposal	Comment
O. Jackson	46 Second Ave. Lot no. 34 size 33'x99'	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake	Inadequate
B. Sheldon	48 Second Ave. Lot no. 36 size 33'x99'	Not Known	Septic tank without a tile bed 575 gal. tank. Effluent drains to a street ditch and flows east to the lake	Inadequate
D. Moore	Second Ave. Lot no. 558 size 33'x99'	4	Septic tank without a tile bed 575 gal. tank. Effluent drains to a swamp to the east of the house then flows south to the lake by means of a culvert	Inadequate
E. Brake	21 Third Ave. Lot no. size	2	Septic tank with tile bed gal. tank. Grey water goes to lake by means of a pipe	Inadequate
Wilkinson	29 Third Ave. Lot no. size	2	Septic tank without tile bed gal. tank. Effluent drains to a street ditch and flows east to lake	Inadequate

APPENDIX 4-2

BACTERIOLOGICAL RESULTS

Date	No.	Location	Total	Fecal
June 9	A1	Raven Beach	3,000	40
10	A1	Raven Beach	10	4
10	A1	Raven Beach	10	4
14	A1	Raven Beach	10	4
9	A2	Government Docks	200	40
9	A3	Government Beach	1,000	40
10	A3	Government Beach	280	108
10	A3	Government Beach	580	148
14	A3	Government Beach	10	4
9	A4	Boat Beach	1,000	40
9	A5	Creek by the Sewage Plant	80,000	9,800
10	A5	Creek by the Sewage Plant	7,500	7,240
14	A5	Creek by the Sewage Plant	12,000	12,000
9	A6	Spoon Bay West of the Creek	1,000	400
9	A7	Sewage Plant Effluent	18,000	40
9	A8	Ditch by the M.T.C. Road	1,000	40
9	A9	N.W. Corner of Ont. & 4th St.	20,000	5,400
9	A10	S.W. Corner of Ont. & 4th St.		
9	A11	S.E. Corner of Ont. & 4th St.	80,000	12,000
10	A11	S.E. Corner of Ont. & 4th St.	80,000	12,000
9	A12	N.E. Corner of Ont. & 4th St.	80,000	12,000
9	A13	Pipe from the separate school to creek	3,000	1,000
10	A13	Pipe from the separate school to creek	9,000	5,000
14	A13	Pipe from the separate school to creek	5,000	5,000
14	A14	Ditch by 308 Government Rd.	80,000	4,600
9	A15	Ditch by 319 Government Rd.	1,000	40
14	A15	Ditch by 319 Government Rd.	1,400	600
9	A16	Ditch behind house on 2nd Ave.	80,000	12,000
9	A17	Where this ditch joins the main ditch	10,000	8,000

APPENDIX 4-2 (Cond't)

Date	No.	Location	Total	Fecal
June 9	A18	Ditch in front of 14 Second Avenue	80,000	12,000
9	A19	Ditch in front of Lot #250	80,000	12,000
9	A20	First pipe into lake across second Avenue	80,000	12,000
9	A21	Second pipe into lake across 2nd Avenue	8,000	8,000
9	A22	Swamp on the N.E. side of Second Avenue	7,200	7,200
9	A24	Lake where lot 342 empties into it	5,000	200
9	A26	Ditch in front of lot 342	80,000	12,000
9	A27	Ditch in front of 29 Third Avenue	14,000	1,000
9	A28	Shore line at 21 Third Avenue	3,000	800
9	A29	Shore line at lot 342-A	600	40
9	A30	Shore line at lot 9 - 5th Avenue	1,000	40
9	A31	Shore line at lot 492	1,000	200
9	A32	Main creek between 6th and 7th Avenue	80,000	12,000
	A32	Direct pipe from lot 342-A	40,000	400
10	B3	186 Government Rd.	80,000	12,000
10	B4	Corner of Ontario St. & Government Road	80,000	2,200
10	B5	298 Government Road		
10	B6	317 Govt' Rd. - ditch to west of house	80,000	12,000
10	B7	Texaco Station	200	40
10	B9	N.W. ditch on 2nd Ave.., between Ont. & Commissioner's	80,000	12,000
10	B10	S.W. ditch on 2nd Ave., between Ont. & Commissioner's	80,000	12,000
10	B11	Ditch in front of 61 Ont. St.	61,000	1,600
10	B12	Ditch in front of 83 Ont. St.	80,000	12,000
10	B13	Creek behind Golden Anchor Motel	80,000	12,000
14	B13	Creek behind Golden Anchor Motel	80,000	12,000
10	B14	Ditch behind 54 Ontario Street	80,000	12,000
10	B19	Ditch in front of 200 4th Ave.	80,000	12,000

APPENDIX 4-2 (Cond't)

Date	No.	Location	Coliform Organisms Total	Coliform Organisms Faecal
June 10	B20	Ditch behind 100 Commissioner St.	80,000	12,000
	B21	Ditch behind 189 4th Avenue	80,000	12,000
	B22	Swamp to the West of 221 4th Ave.	80,000	12,000
	B24	Behind 200 6th Ave.	80,000	12,000
	B25	Communal pipe between 6th and 7th Avenue	80,000	12,000
	B27	Ditch behind 232 7th Avenue	80,000	12,000
	B29	Ditch in front of 220 8th Avenue	80,000	12,000
	B30	Ditch to the east of 208 8th Avenue	80,000	12,000
	B33	Communal ditch behind 209 3rd Avenue.	80,000	12,000
	B34	Ditch in front of 205 8th Avenue	80,000	12,000
	B35	Creek at the south side of 6th Avenue	80,000	12,000
10	B36	Creek North of Government Road.	76,000	74,000

APPENDIX 4-3
SURVEY TECHNIQUES

Technique and Results

The door-to-door survey was conducted on June 8th and June 10th in the unsewered area of Larder Lake to determine the means of sewage disposal for each residence.

The bacteriological samples were taken throughout the entire survey period. These sampling points are indicated on the map included in Appendix 1-1.

Samples were also taken along the main creek, at points where sewage from ditches and pipes was entering. Beach samples were also taken.

The routine chemical samples were taken at 6 locations within the creek basin. The sampling provided for an anlysis of the following parameters; phenols, a routine chemical, cyanide, heavy metals scan, and a bacteriological determination.

APPENDIX 5

5-1 INTERPRETATION OF CHEMICAL ANALYSIS

5-2 CREEK SAMPLE RESULTS

APPENDIX 5-1

INTERPRETATION OF CHEMICAL ANALYSIS

Hardness

Hardness is a result of divalent metallic cations The principle cations are calcium, magnesium, strontium, ferrous iron and manganous ions. A water body can pick-up these cations simply through contact with certain soils and rock types. Hardness has little sanitary significance, but can have an effect on the quality of water pipes and certain kitchen appliances. Excessive hardness is an inconvenience in that it inhibits, the formation of suds when in contact with soap.

Alkalinity

The alkalinity of water is a measure of its capacity to neutralize acid. The main component of alkalinity is the bicarbonate ion. There are no particular limits for alkalinity and it has little sanitary significance.

pH

pH is a measure of the hydrogen ion concentration of water. Natural waters range from 5.5 to 8.6. Certain pH levels are more conducive to the growth of certain types of biological organisms.

APPENDIX 5-1 (cond't)

Iron (Fe)

Iron causes few sanitary problems, but will cause aesthetic problems concerning the taste, smell, and the colour of water. Iron will also corrode pipes, sewers etc. The products of this corrosion are potential pollutants. Other problems can develop as a result of a particular species of bacteria which grows in the presence of iron. Sewers and pipes can become clogged by masses of springy growths associated with these iron bacteria.

Chloride (Cl)

Before the development of bacteriological testing procedures, chemical tests for chloride and for nitrogen in its various forms, were used to detect the presence of sewage in water. Human excreta, particularly the urine, contains chlorides in approximately the same amounts as consumed. Sewage therefore can add a considerable amount of chloride to a receiving stream. Chloride concentrations are used as a measure of sewage strength. High levels of chlorides may indicate that one of the salts containing chloride is being used as a highway de-icer.

APPENDIX 5-1 (cond't)

Sodium (Na)

Sodium is an essential nutrient to all forms of life. It is generally considered non-toxic; however, people with hypertension should avoid drinking water with high levels of sodium. Elevated levels of sodium may indicate that a sodium salt is being used for a highway de-icer.

Potassium (k)

Potassium is an essential non-toxic nutrient required by all forms of life. In most natural water, the concentration of potassium is much lower than the concentration of sodium.

Sulphates (SO_4)

Sulphates are a natural ionic component of water. Sulphates are also found in human waste. These ions can serve as an oxygen source for bacteria, the resulting product after conversion are hydrogen and sulphide gas. This gas presents a distinct odour to the water. As well as the odour problem there is a slime associated with these sulphur reducing bacteria.

Calcium (Ca)

Calcium is also a necessary nutrient for the growth of life forms. This element is a major contributor to water hardness.

APPENDIX 5-1 (cond't)

Calcium (Ca) (cond't)

Calcium is found naturally in water and in varying concentrations according to the waters proximity to certain contributing geological formations.

Total Kjeldahl Nitrogen

Total kjeldahl nitrogen is a measure of the organic nitrogen plus the inorganic free ammonia present in a sample. Nitrite and nitrate nitrogen measurements are not included. The difference between the total kjeldahl and the free ammonia yields the amount of organic nitrogen present. The normal range for total kjeldahl is 0.1 to 0.5 ppm.

Nitrogen is converted during a sequence of biochemical reactions from the organic to the nitrite and then nitrate forms. The relative concentrations of these compounds can be used as an indication of how far these reactions have progressed. A high kjeldahl accompanied by low nitrite and nitrate levels may indicate a recent input of sewage. The presence of organic nitrogen in the sewage indicates that it has not yet had sufficient time to decompose to the more highly oxidized products in the nitrogen cycle.

APPENDIX 5-1 (cond't)

Nitrite Nitrogen

Nitrite is an intermediate substance formed by autotrophic nitrifying bacteria during the decomposition of organic nitrogen and prior to the formation of nitrate. Since nitrite is highly unstable, bacteria rapidly convert it to other compounds. Nitrite levels exceeding 0.02 ppm denote that bacterial action is taking place.

Nitrate Nitrogen

Bacteria oxidize nitrite to form nitrate, the end production in the decomposition of organic nitrogen. The relative concentration of nitrate signifies to what extent organic nitrogenous matter has been broken down. High nitrate levels are undesirable in drinking water supplies because they contribute to methemoglobinemia in infants; high levels of nitrate in surface waters serve to promote undesired algal growth. A low concentration in natural waters would be 0.1 ppm, with a moderate concentration in the range of 0.1 to 1.0 ppm; a high concentration would exceed 1.0 ppm.

APPENDIX 5-1 (cond't)

Total Phosphorus as P

Phosphorus does not occur free in nature but rather in the form of phosphates in many minerals. Phosphorus is an essential nutrient for the growth of plants and animals. Sewage normally contains high levels of phosphorus and nitrogen. They are essential components of sewage treatment necessary for the decomposition of organic matter. However, if released into the environment, the phosphorus acts with the nitrogen as an undesirable fertilizer promoting algae blooms, weeds and nuisance organisms. Levels should be kept where they will not encourage the growth of algae or where they would interfere with the sewage treatment process. Levels in raw sewage range from 6 to 12 ppm.

Ministry requirements for the control of phosphates in sewage effluent within the Province of Ontario are variable. In areas where degradation of the water quality has not been detected and/or determined, phosphate removal has not been required. Those areas within the Atlantic Watershed and under the consideration of the IJC (International Joint Commission) have instituted the criteria of 1.0 mg/l. In certain recreational and intensive use areas, where studies have been carried out, a criteria of 0.3 mg/l of phosphate as P have been introduced.

APPENDIX 5-1 (cond't)

Biochemical Oxygen Demand (BOD_5)

Chemical reactions performed by bacteria during the decomposition of organic matter in the water deplete the amount of dissolved oxygen available. When untreated sewage is discharged to a watercourse, large volumes of organic matter are added. To measure the biochemical oxygen demand, the sample is aerated, sealed and incubated at 20°C for a five day period. The residual oxygen consumed is roughly proportional to the amount of biodegradable organic matter present. Natural BOD_5 levels higher than 3 mg/l indicate that a large quantity of oxygen will be required for stabilization and that a proportionally large volume of organic matter is present. Excessive oxygen demands will result in the depletion of oxygen levels in the receiving stream and the possible onset of septic conditions.

The desirable criteria for BOD_5 in sewage effluent in Ontario is 20 mg/l.

APPENDIX 5-1 (cond't)

Conductivity

Conductivity is defined as the reciprocal of a water's electrical resistance measure between electrodes one square cm. in area and one centimeter apart.
This reading is used to determine the amount of dissolved solids present. These dissolved solids will conduct an electric current when they are in the ionized form. In natural waters the conductivity is mainly due to dissolved inorganic substances, chloride, sulphate, and nitrate ions. There is no set limit for conductivity as this parameter is used to determine the additive effect of the ions in solution.

Solids

Dissolved solids in natural waters are mainly carbonates, bi-carbonates, chlorides, sulphates, phosphates, calcium, magnesium, sodium, and potassium, with some iron and manganese. Levels of these solids can be raised by the addition of chemical wastes, dissolved salts in domestic sewage, and by drainage waters from roads. Suspended solids increase with the erosion of silt, and the addition of organic detritus. Domestic and industrial wastes will increase the suspended solids level.

APPENDIX 5-1 (cond't)

BACTERIOLOGICAL EXAMINATION

Total Coliform Organisms

Total coliform organisms include a wide variety of bacteria ranging from the genus (Group), Escherichia Coli, which originate mainly in the intestines of man and other warm-blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil but are also present in faeces in small numbers.

The presence of total coliforms in water may indicate soil runoff or more important, less recent faecal pollution since organisms of the Enterobacter - Citrobacter groups tend to survive longer in water than do members of the Escherichia Coli group, and even multiply when suitable environmental conditions exist.

Faecal Coliform Organisms

The faecal coliform organisms are those coliform bacteria which are intestinal in origin and usually outnumber all other coliform types in human and animal intestines. Most of the coliform bacteria found by the faecal coliform test are of the genus Escherichia Coli. However, their death rate outside the warm body is high and accordingly if coliforms present in the water are primarily faecal coliforms, and their number is high, the pollution is probably nearby and recent.

APPENDIX 5-1 (cond't)

Smaller numbers with a high portion of faecal Coliforms may indicate nearby pollution with counts reduced by dilution.

Bacteriological Criteria

Bacteriological sample results are reported as "Coliform count per 100 millilitres". As described above, sample results may indicate natural surface water contamination and/or sewage contamination. It is reasonably certain that disease organisms are absent if no pollution indicator bacteria (coliforms) are found during sample examinations.

Ministry criteria for total coliform/faecal coliform counts per 100 millilitres are as follows:

	Total Faecal
(a) Drinking water	0/0
(b) Private Water Supply (before chlorination)	100/10
(c) Private Water Supply (before chlorination and filtration)	400/40
(d) Recreational purposes (swimming etc.)	1000/100
(e) Public surface water supply prior to treatment, permissible	5000/500

APPENDIX 5-2

CREEK SAMPLE RESULTS

Sample No.	Location	Total Coliform Org/100 mls	Fecal Coliform Org/100 mls	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Phosphorus	Chloride	Sodium	Potassium	Conductivity UmHos/cm	Hardness	Sulphate	Calcium
C-1	Creek North of Hwy #66	>80,000	>12,000	.03	1.6	<.01	<.01	.03	2.2	2.9	.30	58	27	11	7.2
C-2	Creek South of Hwy #66	>80,000	>12,000	2.0	6.0	<.01	<.01	.97	80	42	1.75	395	79	11	24
C-3	Creek at Separate School	9,000	5,000	2.3	5.8	.07	0.2	.52	85	45	3.45	510	129	12.5	37
C-4	Creek at Ont. St. & 4th Ave.	>80,000	>12,000	5.9	11.0	.06	.08	1.7	120	84	4.0	740	132	12.5	39
C-5	Culvert at 6th Ave.	>80,000	>12,000	5.2	9.25	.15	.21	1.25	130	82	3.7	740	144	12.5	42
C-6	Creek at Lake Shore Road	>80,000	9,800	1.88	2.66	.017	.048	0.6	5.0	34	2.05	125	123	25	36

APPENDIX 5-2 (cond't)

CREEK SAMPLE RESULTS

Sample No.	Location	Suspended Solids	Dissolved Solids	B.O.D.	pH	Phenol ppb	Cyanide	Iron	Copper	Nickel	Lead	Zinc	Cadmium	Arsenic
C-1	Creek North of Hwy #66	18	39	2.4	6.4	1	<.01	3.6	<.01	.02	<.01	<.01	<.01	.002
C-2	Creek South of Hwy #66	47	257	24	7.1	7	<.01	3.0	<.01	.02	<.01	<.01	<.01	.003
C-3	Creek at Separate School	175	375	6.0	7.1	2	<.01	11	<.01	.02	<.01	.02	<.01	.002
C-4	Creek at Ont. St. & 4th Ave.	112	444	10	7.3	6	<.01	6.7	<.01	.02	<.01	.07	<.01	.004
C-5	Culvert at 6th Ave.	54	445	24	7.39	2	<.01	3.8	<.01	.01	<.01	.08	<.01	.004
C-6	Creek at Lake Shore Road	13	276	4.0	8.96	1	<.01	1.4	<.01	.01	<.01	.03	<.01	.004

NOTE: - All results in Mg/l unless otherwise stated.

Coliform organisms measured per 100 ml sample

pH - no units

APPENDIX 6

6-1 LAKE SURVEY TECHNIQUES

6-2 LAKE SURVEY SAMPLE RESULTS

6-3 LAKE SURVEY SAMPLE LOCATIONS

APPENDIX 6-1

LAKE SURVEY TECHNIQUES

Secchi Disc Reading

A secchi disc reading is a measure of the light transmission capacity of the water. It is important in the determination of the physical quality of the water.

The disc is lowered into the water on the shaded side of the boat. When the disc disappears the depth is measured and then raised slowly until the disc just comes into view, then another reading is taken. The arithmetical means of these two readings is the Secchi disc depth.

Dissolved Oxygen

Chemical reactions performed by bacteria during the decomposition of organic matter deplete the amount of dissolved oxygen available in the water. Sewage has a large amount of these oxygen depleting bacteria. When sewage is discharged into a watercourse such as Larder Lake, large volumes of the oxygen requiring bacteria are added, thus causing a reduction in the dissolved oxygen (D.O.). These readings are used as an indication of sewage being discharged into a body of water.

APPENDIX 6-1 (cont'd)

The oxygen levels were taken by a YSI D.O. meter. The measurements were taken at three meters below the surface, with the results being expressed in parts per million.

Temperature readings were also taken with the same meter with the results expressed in degrees celsius.

APPENDIX 6-2

Lake Survey Sample Results

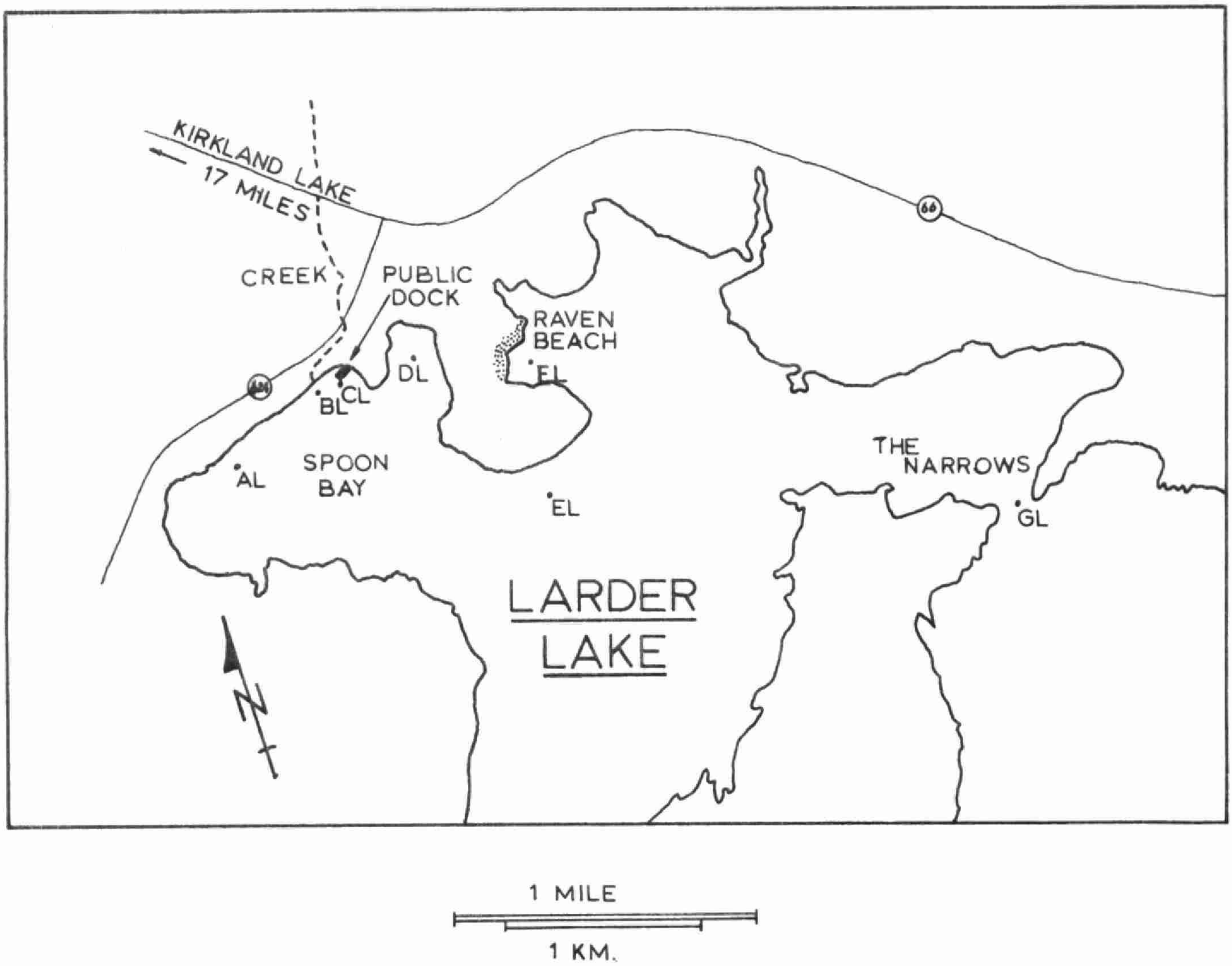
Sample No.	Location	Total Coliform Org/100 mls	Faecal Coli-form Org/100 mls	Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Chloride	Phosphorus	Sulphate	Potassium
AL	Spoon Bay West	70	36	<.1	0.4	<.01	0.5	8	.04	27	.04
BL	300' off-shore from Creek	180	56	<.1	0.5	<.01	0.5	8	.03	27	.03
CL	300' off-shore from Gov't Dock	12	12	<.1	0.5	<.01	0.5	8	.04	27	.04
DL	Bay East of Market Street	30	20	<.1	0.5	<.01	0.5	6	.03	26	.03
EL	South of Peninsula	10	4	<.1	0.4	<.01	0.5	2	.04	28	.04
FL	300' off-shore from Raven Beach	10	4	<.1	0.4	<.01	0.5	2	.02	27	.02
GL	The Narrows	20	8	<.1	0.4	<.01	0.5	7	.04	26	.04

APPENDIX 6-2 (Cond't)

Lake Survey Sample Results

Sample No.	Location	Sodium	Hardness	Alkalinity	pH	Iron	Conductivity UmHos/Cm	Secchi Disc (m)	D.O. ppm	Temp °C
AL	Spoon Bay West	4	67	39	7.3	.10	161	2.5	10.6	13
BL	300' off-shore from Creek	4	66	40	7.5	.10	153	2.2	4.0	13.5
CL	300' off-shore from Creek	3	66	40	7.6	.10	151	3.0	10.6	14
DL	Bay East of Market Street	3	66	40	7.7	.05	150	2.0	9.8	14
EL	South of Peninsula	3	66	38	7.8	.10	150	3.3	10.2	13.5
FL	300' off-shore from Raven Beach	3	66	39	7.8	.05	150	3.3	10.1	13.5
GL	The Narrows	3	67	40	7.8	.05	150	3.3	9.9	14

Note: - All results in Mg/l unless otherwise stated
Coliform organisms measured per 100 ml sample
pH - no units



SECTION 6-3
SAMPLE LOCATIONS